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## Implant programs affect performance and quality grade

### Abstract

Selection of dosage, timing, and number of anabolic implants continues to be a source of controversy for feed yard managers and their consultants. Although the dose-dependent effects on performance are fairly well accepted, impacts on carcass quality continue to be debated. This study was intended to summarize effects of different implant programs on performance and carcass quality on the basis of a cross section of available published research.

### Keywords

Cattlemen's Day, 2010; Kansas Agricultural Experiment Station contribution; no. 10-170-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1029; Beef Cattle Research, 2010 is known as Cattlemen's Day, 2010; Beef; Implants; Performance; Quality grade; Carcass traits

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# Implant Programs Affect Performance and Quality Grade

*C.D. Reinhardt*

## Introduction

Selection of dosage, timing, and number of anabolic implants continues to be a source of controversy for feed yard managers and their consultants. Although the dose-dependent effects on performance are fairly well accepted, impacts on carcass quality continue to be debated. This study was intended to summarize effects of different implant programs on performance and carcass quality on the basis of a cross section of available published research.

## Experimental Procedures

A total of 83 studies (61 steer studies and 22 heifer studies) were included in a meta-analysis of the effects of implant program on feedlot performance (daily gain, dry matter intake, and feed conversion) and carcass traits (hot carcass weight, yield grade, and marbling score).

Individual implant programs were consolidated into groups of similar dose programs (Table 1). Any combinations of implant groupings used in reimplant programs were coded according to dosage (e.g., Synovex-S followed by Synovex-Plus = MOD/HIGH). If no implant was given immediately upon feedlot arrival but a full-strength combination estradiol + trenbolone acetate implant was given later in the feeding period, this program was coded DEL for “Delayed.”

Data were analyzed with the MIXED procedure of SAS (SAS Institute Inc., Cary, NC); implant program was the fixed effect, and study was the random effect. Studies were analyzed within sex, and the inverse of squared standard error of the mean for daily gain was used as a weighting factor.

## Results and Discussion

In both steers and heifers, increasing the implant dosage (higher anabolic content per implant, combination vs. estrogenic only, or multiple implants vs. single implants) generally increased daily gain and dry matter intake, reduced feed-to-gain ratio, and increased hot carcass weight ( $P < 0.01$ ; Tables 2 and 3).

Implant program influenced marbling score in both steers and heifers ( $P < 0.01$ ; Tables 4 and 5). Implant program did not affect yield grade in steers ( $P = 0.11$ ; Table 4) but did in heifers ( $P < 0.01$ ; Table 5). Previous studies have demonstrated that yield grade is correlated with marbling score (Figure 1). Given that implant program affected both yield grade and marbling score in heifers in this meta-analysis, at least a portion of the differences in marbling score among implant treatments may be due to concomitant changes in yield grade. In addition, feed yards tend to market cattle at a fat-constant

endpoint regardless of implant program selection. Therefore, an adjustment was made to actual marbling score by using the following equation:

$$\text{Adjusted marbling score} = (\text{yield grade} - 2.82) \times 43.63$$

where 2.82 = mean yield grade of non-implanted cattle and 43.63 = slope of the relationship between yield grade and marbling score.

After marbling scores were adjusted for differences in yield grade, implant program still had a significant effect on marbling score in steers, but marbling score differences in heifers were eliminated ( $P=0.50$ ).

Although these data suggest that implant program affects marbling score, it is also important to understand how economically important these differences may be. Therefore, the relationship between average marbling score within a pen and percentage of that pen that graded Choice or higher was determined (Figure 2).

A difference in marbling score of 20 units (similar to the difference between DEL/HIGH vs. MOD/HIGH) resulted in an 8 percentage unit change in percentage Choice for cattle grading roughly 50% Choice but only a 4 percentage unit change in percentage Choice for cattle grading nearly 90% Choice.

## Implications

Because of physiological differences between heifers and steers, implants have a more pronounced effect on marbling score in steers than in heifers.

**Table 1. Summary of implant program groupings and codes**

Implant program	Grouping	Code
No implant	None	NONE
Ralgro	Low	LOW
Synovex-S	Moderate	MOD
Synovex-H	Moderate	MOD
Revalor-IS	Intermediate	INT
Revalor-IH	Intermediate	INT
Synovex-Choice	Intermediate	INT
Revalor-S	High	HIGH
Revalor-H	High	HIGH
Revalor-200	High	HIGH
Synovex-Plus	High	HIGH

**Table 2. Effects of implant program on feedlot performance and carcass weight in steers**

Implant program	Initial weight, lb	Average daily gain, lb	Feed:Gain	Dry matter intake, lb	Hot carcass weight, lb
NONE	734	3.11	6.51	19.96	737
MOD	735	3.51	6.04	20.97	779
DEL/HIGH	734	3.61	5.80	20.59	787
MOD/MOD	735	3.62	5.92	21.27	790
HIGH	733	3.67	5.84	21.24	786
INT/INT	736	3.68	5.81	21.23	794
LOW/HIGH	734	3.68	5.80	21.19	793
MOD/HIGH	735	3.71	5.75	21.21	798
INT/HIGH	734	3.72	5.77	21.22	800
HIGH/HIGH	735	3.79	5.66	21.34	806
P-value	0.46	<0.01	<0.01	<0.01	<0.01
SEM <sup>1</sup>	1.36	0.047	0.064	0.154	5.8

<sup>1</sup> SEM represents the largest standard error of the mean of all treatments for each dependent variable.

**Table 3. Effects of implant program on feedlot performance and carcass weight in heifers**

Implant program	Initial weight, lb	Average daily gain, lb	Feed:Gain	Dry matter intake, lb	Hot carcass weight, lb
NONE	707	2.94	6.36	18.88	695
MOD	703	2.96	6.36	18.85	703
MOD/MOD	702	3.01	6.27	18.85	708
LOW/HIGH	706	3.30	5.85	19.31	717
DEL/HIGH	707	3.30	5.74	19.09	731
MOD/HIGH	707	3.33	5.79	19.36	733
INT/INT	708	3.34	5.78	19.35	734
HIGH	707	3.34	5.89	19.65	730
INT/HIGH	706	3.37	5.73	19.44	739
HIGH/HIGH	709	3.40	5.69	19.36	738
P-value	0.18	<0.01	<0.01	<0.01	<0.01
SEM <sup>1</sup>	4.6	0.076	0.102	0.269	9.4

<sup>1</sup> SEM represents the largest standard error of the mean of all treatments for each dependent variable.

**Table 4. Effects of implant program on carcass traits in steers**

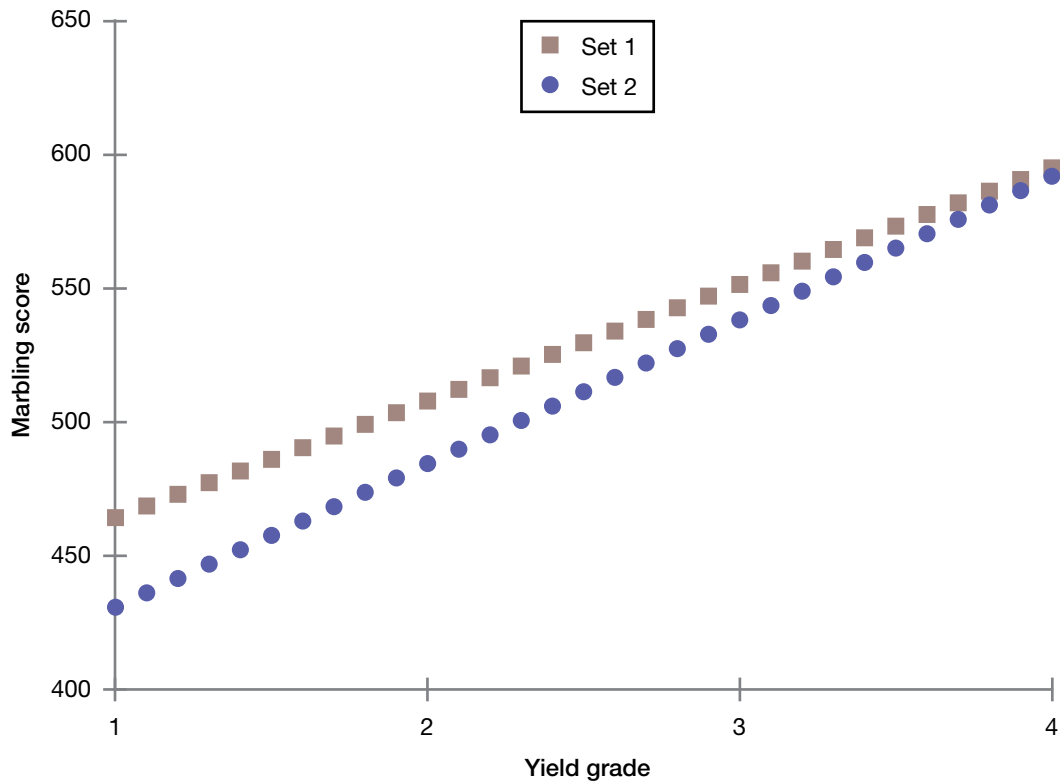
Implant program	Yield grade	Marbling score	Adjusted marbling score
NONE	2.83	550	548
MOD	2.88	538	535
DEL/HIGH	2.85	529	526
MOD/MOD	2.85	524	520
HIGH	2.83	520	521
INT/INT	2.71	521	525
LOW/HIGH	2.83	522	518
MOD/HIGH	2.87	512	507
INT/HIGH	2.80	513	513
HIGH/HIGH	2.82	498	499
P-value	0.11	<0.01	<0.01
SEM <sup>1</sup>	0.061	7.4	6.4

<sup>1</sup> SEM represents the largest standard error of the mean of all treatments for each dependent variable.

**Table 5. Effects of implant program on carcass traits in heifers**

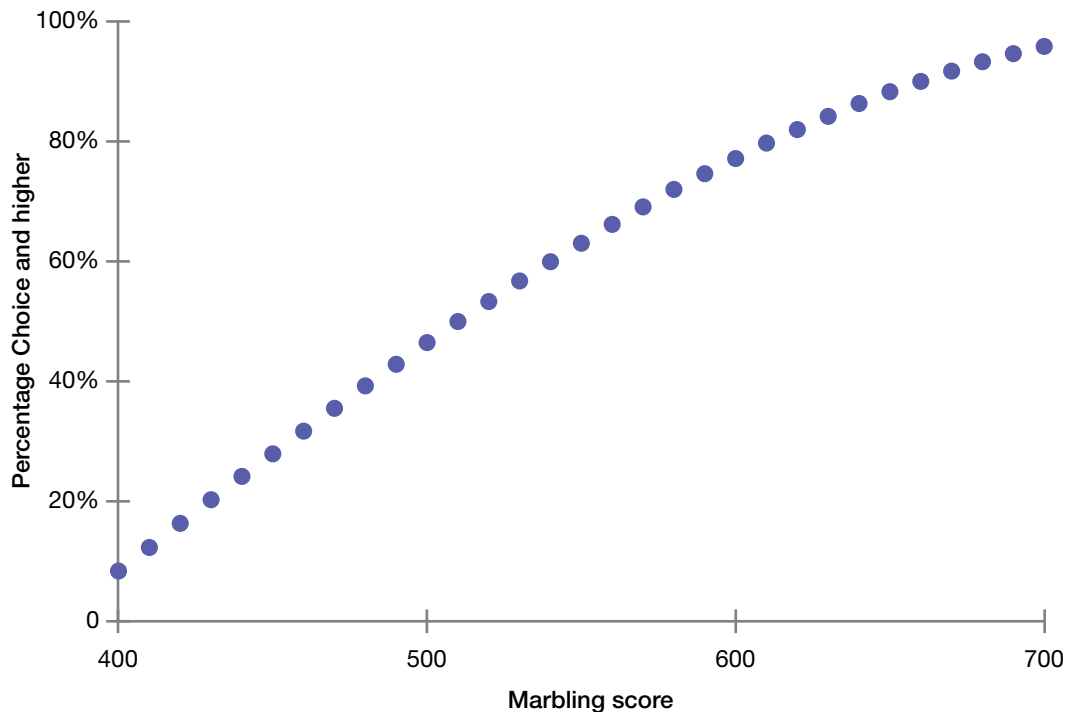
Implant program	Yield grade	Marbling score	Adjusted marbling score
NONE	2.66	543	546
MOD	2.59	523	522
MOD/MOD	2.68	538	545
LOW/HIGH	2.68	---	---
DEL/HIGH	2.44	535	550
MOD/HIGH	2.39	524	540
INT/INT	2.46	533	547
HIGH	2.55	532	542
INT/HIGH	2.49	528	540
HIGH/HIGH	2.35	512	532
P-value	0.11	<0.01	0.50
SEM <sup>1</sup>	0.135	9.4	9.3

<sup>1</sup> SEM represents the largest standard error of the mean of all treatments for each dependent variable.



**Figure 1. Relationship between yield grade (calculated from carcass measurements) and marbling score ( $\text{Small}^0 = 500$ ).**

Set 1 is the current dataset of 83 individual implant studies (marbling score =  $53.77 \times \text{yield grade} + 377.0$ ;  $R^2 = 0.28$ ). Set 2 is a set of 4,991 Angus-cross steer calves fed in southwestern Iowa from 2002-2006 (marbling score =  $43.63 \times \text{yield grade} + 320.7$ ;  $R^2 = 0.07$ ).



**Figure 2. Relationship between average marbling score ( $\text{Small}^0 = 500$ ) in a pen of cattle and the percentage of the pen that graded Choice or higher.**

(Percentage Choice =  $0.00399 \times (\sin \text{Marbling Score}) - 1.5119$ ;  $R^2 = 0.78$ ).